The HydroMet Decision Support System: New Applications in Hydrology

J. William Conway and Michael D. Eilts
Weather Decision Technologies, 1818 W Lindsey St, Build D, Suite 208,Norman, Oklahoma 73069, USA

Weather Decision Technologies (WDT) in collaboration with the US National Severe Storms Laboratory (NSSL) has developed a turn-key hydro-meteorological hardware and software package termed the HydroMet Decision Support System (HDSS). This system integrates data from radar, rain gauges, satellites and numerical models to provide high resolution Quantitative Precipitation Estimates (QPE) and Quantitative Precipitation Forecasts (QPF).

HDSS includes the following components:

1. 3D Mosaic Algorithm – The 3D Mosaic Algorithm is a package that ingests any number of radars available. Using optimized scanning procedures to take into account beam blockage and radar elevation differences, the algorithm performs quality control on the data including ground clutter and AP removal, “conical ring” correction, calibration correction, and bright band identification. After quality control is performed data from the radars is interpolated to a high resolution 3D grid used in other HDSS applications.

2. The McGill Algorithm for Precipitation Nowcasting Using Semi-Lagrangian Extrapolation (MAPLE) – MAPLE is a package developed by McGill University of Canada that uses (quality controlled) output from the 3D Mosaic Algorithm to produce reflectivity forecasts out to 6 hours in advance. These forecasts are used for determination of QPF and flash flood prediction.

3. Rainfall QPF algorithm – this algorithm uses output from the MAPLE forecasts to produce QPF estimates out to several hours in advance. At each gridpoint across the domain the algorithm accumulates total precipitation amounts by applying different Z-R and/or Z-S relationships based on whether the precipitation is liquid, frozen, stratiform, and/or convective. The Z-R and Z-S relationships can be further stratified based on geographical regions.

4. Vertical Profile of Reflectivity (VPR) algorithm – this algorithm determines vertical profiles of reflectivity at close ranges to the radar in both stratiform and convective situations to correct the lower portions of profiles at longer ranges from the radar where the beam is significantly above the earth’s surface. These corrected data are then used for derivation of QPE and QPF applications within HDSS.

5. Quantitative Precipitation Estimation and Segregation Using Multiple Sensors (QPE-SUMS) – this algorithm uses 3D Mosaic Algorithm output, satellite, model, VPR, surface, and rain gauge data to determine QPE values over the given domain. QPE-SUMS produces estimates over a 72 hour period. The algorithm uses variable Z-R and Z-S relationships as in the Rainfall QPF algorithm to determine QPE values. Objective analysis of rain gauge data is used in real-time to estimate and correct for biases between the QPE-SUMS output and the gauge data.

6. Flash Flood Prediction Algorithm (FFPA) – this algorithm utilizes delineated basins covering a region as a basis for flash flood monitoring and prediction. FFPA combines output from Rain Predictor and QPE-SUMS to provide as accurate as possible total

forecast rainfall accumulations for each basin. The FFPA compares the forecast basin accumulations against user adaptable Flash Flood Guidance (FFG) values for each basin. Warnings are automatically generated for basins whose total accumulations are approaching or exceeding FFG values.

7. HDSS Displays – two display systems are available for HDSS: WxScope – a Web based display that can be accessed anywhere an internet connection is available; and 3D Sigma – a full three dimensional workstation environment used for data and product analysis.

This talk will discuss the various components and applications of the HDSS in relationship to the applications within operational systems.

Contact Information: J. William Conway - bconway@wdtinc.com